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GEOGRAPHY AND MENTAL IMAGES—AN EXPERIMENTAL STUDY.

No one thinks nowadays of teaching geography by the old catechetical method in use fifteen years ago. What was formerly a valley of dry bones through which the child wandered drearily, picking up a dead definition here and there, has blossomed into a broad and beautiful field which teems with things full of interest to the learner. Instead of beginning with the abstract definitions belonging to logic, we now begin with the concretest thing possible to the child—his already accumulated experience on the one side, and on the other its counterpart, the environment out of which his experience has grown. No longer seeking the remotest possible point from the child for a beginning, we now find in his own immediate interests and occupations the best vantage ground. And, what is not less significant, we have come to see in the social interests and occupations the beginning of *all* education, and hence to realize that only as geography has a social basis does it find its true point of departure.

Geography is primarily not a thing to be learned, but something to be experienced, for the first subject-matter of geography is the immediate environment of the child. It has been said to be the study *par excellence* for training the imagination. But this is true only when, and in so far as, it first trains perception. Nothing ever enters the imagination all the elements of which have not been present in perception. Nor is a memory image ever clearer and more perfect than the original perception. It is fortunate if it even approximates the perception in vividness and lifelikeness. Even granting clear perceptions and vivid memory images, the imagination may still be faulty through a failure to utilize the images already at hand in the construction of new ones. The fact that we have shown the child a two-by-four mud puddle with an isthmus doing duty in the middle of it is not a safe warrant that he has a clear notion of an isthmus; it is not a safe warrant even when our device is supplemented by calling attention to the fact of the striking analogy to be found in the case of the human body, where the neck connects the head and the trunk! Neither can we assume, after the child has molded a relief map showing the plains, hills, and mountains, or even after he has seen hills of some two hundred to three hundred feet—which is about the limit in the Mississippi valley—that he has more than the faintest and most inadequate idea of a mountain. Likewise, the black streaks on the map which are meant to represent rivers may still be but black streaks and nothing more to the boy, although he has fished, and waded, and swum in the real river. He may fail to make use of his past experiences in the formation of new images.

No doubt the child's first images are more or less crude and imperfect from the very necessity of the case, resting as they do on a very limited experience. He cannot be expected to know a mountain as an Alpine guide knows it, or to understand a coast line as a navigator does, until he has had at least a measure of their experience. This is a stage of mental development through which all must pass, but the question may be raised whether there are not too many cases of arrested development at this stage.

In order to prevent or correct wrong images, or to induce the formation of a greater number of richer and more complete ones, the first step necessary is to discover from the child the images he already has on hand, or, as President Hall would say, to find out the "contents of his mind." A conviction of this truth led the writer to undertake a study of the children in elementary schools as to the nature of their mental images in connection with work on certain topics in geography. The character of the test to be employed was determined by suggestions from Professor John Dewey, of the University of Chicago.

Fifth, sixth, and seventh grades in the public schools of Chicago and Denver were selected for the test. Replies were received from 386 children of both sexes in Chicago, and from 52 in Denver, making a total of 438. The teachers of these grades were requested to give the following questions as an exercise in English, the children not knowing that it was other than a class exercise:

1. Is an island like a hill? Tell why you think it is or is not.
2. Which is higher, a mountain or a tall chimney? How much? (The teacher to mention some tall chimney known to the school).
3. Is an isthmus like a strait? Tell why you think it is or is not.
4. If all the water in lake Michigan should dry up, what would you see where the lake is now?

In response to the first question, 62 per cent. answered negatively, 30 per cent. affirmatively, and 8 per cent. were doubtful. Seventeen per cent. expressed the idea of the island's extending below the surface of the water, 16 per cent. gave a formal definition of "island," and 14 per cent. of "hill." Thirty-one per cent. said that the difference is that the island has water around it, while the hill has not; 19 per cent. thought that the difference lies in the fact that the hill is higher; and 11 per cent. thought that the difference is in the greater slope of the hill. The best answers were given by the seventh grade, and the second best by the fifth grade. As an illustration, the idea of the part of the island below the surface of the water was expressed by 23 per cent. of the seventh grade, 16 per cent. of the fifth grade, and 12 per cent. of the sixth grade; resorting to formal definition of "island," seventh grade, 10 per cent.; fifth grade, 16 per cent.; and sixth grade, 33 per cent.

But few indicated a complete misconception of a hill or an island, but many showed that their image of one or both was very incomplete and inadequate. The following are taken from the answers:

A hill is a pile of earth covered with brush and trees.

A hill is on the ground, but an island is not.

An island is not like a hill, because it is not round on top.

An island is round, and the four sides slant.

An island is not hilly, because it is a forest.

An island is like a hill, because it is higher in the center.

An island is like a hill, because it is fastened to the water, and extends up above the water.

An island is round like a ball.

An island is not like a hill, because it is a little swamp guarded by rocks.

An island is a little bit of dirt piled up.

An island has no grass on it.

An island is like a hill, because the top comes first.

An island is like a hill, because it rests on the water like a hill rests on the ground.

An island is land pushed up by the water.

In answering the second question, there were 9 per cent. who estimated the chimney as higher than the mountain, and 9 per per cent. who were doubtful, while slightly more than 40 per cent. gave answers evidencing an inadequate conception of their relative heights. Of course, judging on the last point is more or less an arbitrary matter, but the child was given the benefit of the doubt where the language left any question. A good many said that it depends on the size of the mountain. All these were classed as not having an adequate conception of the difference. It is recognized also that some of the difficulty in expressing the difference in the heights may be from the fact that the child has not a proper conception of number, instead of being altogether lacking in his images of chimneys and mountains; for even the Colorado children, who are constantly within sight of mountains, will say that a mountain is from fifty to two hundred feet higher than a chimney. But after making all due allowance for this fact, it would still seem safe to say that very few, if any, children who have never seen a mountain have any real notion of one. Many said that the mountain is higher by two, three, fifteen, or one hundred feet. One says that the mountain is higher, "for it is raised some every year." Others say that if the mountain went straight up like the chimney, it would be the higher, but since it slopes, the chimney is the higher. Here again the fifth and the seventh grades did better than the sixth.

The replies to the third question showed 51 per cent. who thought that an isthmus is not like a strait, and 25 per cent. who thought that it is, and 24 per cent. who were doubtful. Of those who said that they are not alike, 31 per cent. volunteered that the difference is that the one is land and the other water. An average of 27 per cent. showed a misconception of one or both, the greatest misconception appearing again in the sixth grade, where it was 32 per cent. The large number of definitions attempted here is also suggestive, an average of 42 per cent. for all the grades—being 39 per cent. in the fifth, 50 per cent. in the sixth, and 35 per cent. in the seventh grade. That many were relying on formal definition instead of their images of the things themselves is shown by their getting the definitions of "isthmus" and "strait" confused, and some even giving the definition of "cape" instead of "isthmus."

In response to the fourth question, 35 per cent. said that if the water in the lake should dry up, they would see such things as fish, dead bodies, lost ships, shells, plants, rubbish, etc., etc. Forty-nine per cent. mentioned the broad expanse of the lake bed which would be left exposed, and 32 the deep hollow or depression which would be left. Here again the sixth grade fell behind both the others in the fulness of their answers.

It is manifestly impossible in this question to measure the amount of misconception where any occurs. The following extracts are suggestive, however, some of defective images, and some of very vivid ones:

It would be shallow.

Cannot get this one.

Hole so deep would be left that you could not get out.

One could then see Michigan.

There would be left the shape of a great pan.

Hills would be where the islands are now.

The sand would smell very funny.

We would see millions of fish gasping. Would see a large hole with sand and rocks at the bottom.

We would see in the distance a dark body, which, on approaching, would turn out to be a wreck in which would be found dead bodies.

We would see broken pieces of ships, provisions decayed, fishes of all kinds lying around, a great many men and women and children, hills and valleys, long and narrow basins looking like little rivers, basins looking like lakes, and what looks like large plains.

It would look like a bath tub.

We could see all the banks and the piers caved in. Would see a field with cattle grazing, or a mining town.

There would be a sandy, hot, dry place.

You would see ——, but it is not likely to dry up.

You would see the boats way down below, and the tunnels and cribs that make and pump the water to the big water stations.

There would be great piles of rocks left by the glaciers, and cliffs hundreds of feet high.

A basin as deep as the tallest chimney in the world, and fishes flattering around.

Some of these answers were repeated in different ways many times, and an especially large number spoke of the desert which would be left.

While the number of papers examined was not as large as could be desired, yet it seems safe to draw a few conclusions, especially on the points where the evidence seems to agree quite completely.

1. *Too much is taken for granted by the teacher in the matter of children's images.* More attention should be given to developing a method of teaching which will lead the child constantly to clarify and enrich his images by reconstructing his past experiences in the light of his present. He should utilize the images he already has in the formation of new and more perfect ones.

2. *The individual differences of children in the matter of their mental images should be taken more into account in teaching.* The difference of mental content between the rich and varied stock of images on the part of one child and the limited and meager supply of another makes a fundamental difference, not only in the subject-matter suitable for them, but in the method of its presentation as well.

3. *Perfect images cannot be built on imperfect perceptions.* The child who has never perceived that an island really extends below the surface of the water will hardly have a clear image of that part which is out of sight. Nor is it enough to have the clear perception; there must be clear and frequent recalls of the object by means of the memory image, and the image must also be applied in some definite way in the acquisition of new knowledge; else it becomes so much lumber in the mind.

4. *Children at this age are slow in generalizing the particular illustrations which are presented to them.* A number defined "hill" as a pile of dirt with trees around it, or with brush over it. These were the ones who had had their experience of hills from the molding in the schoolroom or from the little artificial hills

in the city parks. They were not able to construct a real, big hill from so small a model. Many gave the difference between a hill and an island as being in the fact that an island is level or flat and a hill not level or flat. The islands of their experience had probably all been flat, and they had never pictured one of any other kind.

5. *The use of formal definitions by the child seems to go along with faulty imaging, and teaching him formal definitions of objects before he has clear images of those objects leads him to faulty imaging.* When he fails to get, or does not choose to get, an image of the object, he falls back on his verbal image of the definition to take its place, even although the definition does not have the shadow of a meaning to him. In proof of this, by far the largest number of definitions in these papers were given in the case of "isthmus" and "strait," where there had been least opportunity for perceiving the real objects, and where the misconceptions were manifestly the most numerous. Forty-two per cent. attempted book definitions, and 27 per cent. evinced a complete misconception of either isthmus or strait, or both, and besides this it is probable that many of those who gave correct definitions had no real notion of the objects they were defining. On the other hand, but 16 per cent. gave definitions of island, and 9 per cent. of hill, and here it could not be determined that there were any complete misconceptions of either. Also, the oldest pupils, those of the seventh grades, gave the fewest definitions, and their papers showed them possessed of the best images, as would be expected. The sixth grades gave the largest per cent. of definitions, which may be accounted for by the fact that they had recently come into the use of the textbook, while most of the fifth grades were still having their instruction orally, and the seventh grades were becoming a little more independent in their thinking.

GEORGE H. BETTS.

DEPARTMENT OF PEDAGOGY, CORNELL COLLEGE,
Mount Vernon, Ia.